CLAIMS

WHAT IS CLAIMED IS:

1. A system for processing articles, the system comprising:

a first fluid supply configured to supply a first process fluid;

a second fluid supply configured to supply a second process fluid;

a first apparatus for controlling flow, the first apparatus having an inlet, an outlet, and a bleed port, the inlet of the first apparatus fluidly coupled to the first fluid supply;

a second apparatus for controlling flow, the second apparatus having an inlet, an outlet, and a bleed port, the inlet of the second apparatus fluidly coupled to the second fluid supply;

a first mounting substrate comprising a first vacuum port and a first outlet port, the first apparatus for controlling flow attached to the first mounting substrate such that the bleed port of the first apparatus for controlling flow is fluidly coupled to the first vacuum port and the outlet of the first apparatus for controlling flow is fluidly coupled to the first outlet port;

a second mounting substrate comprising a second vacuum port and a second outlet port, the second apparatus for controlling flow attached to the second mounting substrate such that the bleed port of the second apparatus for controlling flow is fluidly coupled to the second vacuum port and the outlet of the second apparatus for controlling flow is fluidly coupled to the second outlet port;

a vacuum manifold fluidly coupled to the first and second vacuum ports;

an outlet manifold fluidly coupled to the first and second outlet ports;

a vacuum source fluidly coupled to the vacuum manifold; and

a processing chamber fluidly coupled to the outlet manifold.

2. The system of claim 1 wherein the vacuum manifold comprises a plurality of primary channels extending along a first longitudinal axis and a plurality of feed channels, the first and second vacuum ports of the first and second mounting substrates fluidly coupled to the plurality of primary channels via the plurality of feed channels and wherein the outlet manifold comprises a plurality of primary channels extending along a second longitudinal axis, the first and second longitudinal axes being parallel.

3. The system of claim 2 wherein the plurality of feed channels extend perpendicular to the first longitudinal axis.

4. The system of claim 2 wherein a first plane intersects the inlet and the outlet of the first apparatus for controlling flow, the first plane being perpendicular to the second longitudinal axis.

5. The system of claim 4 wherein the first plane intersects a first one of the plurality of feed channels.

6. The system of claim 4 wherein a second plane intersects the inlet and the outlet of the second apparatus for controlling flow, the second plane being perpendicular to the second longitudinal axis.

~~7. The system of claim 6 wherein the second plane intersects a second one of the plurality of feed channels.~~

~~8.~~7. The system of claim 1 wherein each of the first and second mounting substrates comprises a cradle and a port block.

~~9.~~8. The system of claim ~~8~~ 7 wherein each of the cradles comprise first, second, third, and fourth slots, the first and second slots extending through the cradle from a first side to an opposite second side and the third and fourth slots extending through the cradle from a third side to an opposite fourth side, the first and second sides being perpendicular to the third and fourth sides.

~~10. The system of claim 9 wherein the outlet manifold extends through the first and second slots and the vacuum manifold extends through one of the third and fourth slots.~~

~~11.~~9. The system of claim ~~8~~ 7 wherein the port block of the first mounting substrate comprises the first vacuum port and the first outlet port.

~~12. The system of claim 11 wherein the port block of the second mounting substrate comprises the second vacuum port and the second outlet port.~~

~~13.~~10. The system of claim 1 wherein the outlet manifold comprises a plurality of primary channels, each of the plurality of primary channels extending along a longitudinal axis.

~~14.~~11. A system for controlling process fluids, the system comprising:

a first apparatus for controlling flow, the first apparatus having an inlet, an outlet, and a bleed port, the inlet of the first apparatus configured to receive a first process fluid;

a second apparatus for controlling flow, the second apparatus having an inlet, an outlet, and a bleed port, the inlet of the second apparatus configured to receive a second process fluid;

a first mounting substrate comprising a first vacuum port and a first outlet port, the first apparatus for controlling flow attached to the first mounting substrate such that the bleed port of the first apparatus for controlling flow is fluidly coupled to the first vacuum port and the outlet of the first apparatus for controlling flow is fluidly coupled to the first outlet port;

a second mounting substrate comprising a second vacuum port and a second outlet port, the second apparatus for controlling flow attached to the second mounting substrate such that the bleed port of the second apparatus for controlling flow is fluidly coupled to the second vacuum port and the outlet of the second apparatus for controlling flow is fluidly coupled to the second outlet port;

a vacuum manifold fluidly coupled to the first and second vacuum ports; and

an outlet manifold fluidly coupled to the first and second outlet ports.

~~15.~~12. The system of claim ~~14~~ 11 wherein the vacuum manifold comprises a plurality of primary channels extending along a first longitudinal axis and a plurality of feed channels, the first and second vacuum ports of the first and second mounting substrates fluidly coupled to the plurality of primary channels via the plurality of feed channels and wherein the outlet manifold comprises a plurality of primary channels extending along a second longitudinal axis, the first and second longitudinal axes being parallel.

~~16. The system of claim 15 wherein the plurality of feed channels extend perpendicular to the first longitudinal axis.~~

~~17.~~13. The system of claim ~~14~~ 11 wherein each of the first and second mounting substrates comprises a cradle and a port block.

~~18.~~14. The system of claim ~~17~~ 13 wherein each of the cradles comprise first, second, third, and fourth slots, the first and second slots extending through the cradle from a first side to an opposite second side and the third and fourth slots extending through the cradle from a third side to an opposite fourth side, the first and second sides being perpendicular to the third and fourth sides.

~~19. The system of claim 18 wherein the outlet manifold extends through the first and second slots and the vacuum manifold extends through one of the third and fourth slots.~~

~~20.~~15. The system of claim ~~17~~ 13 wherein the port block of the first mounting substrate comprises the first vacuum port and the first outlet port.

~~21. The system of claim 20 wherein the port block of the second mounting substrate comprises the second vacuum port and the second outlet port.~~

~~22.~~16. The system of claim ~~14~~ 11 wherein the manifold comprises a plurality of primary channels connecting adjacent ones of the mounting substrates, each of the plurality of primary channels extending along a longitudinal axis.

~~23.~~17. A system for transporting process fluids, the system comprising:

a plurality of mounting substrates, each mounting substrate comprising a vacuum port and an outlet port;

a vacuum manifold fluidly coupled to the vacuum ports of the plurality of mounting substrates; and

an outlet manifold fluidly coupled to the outlet ports of the plurality of mounting substrates;

wherein the vacuum manifold comprises a plurality of primary channels extending along a first longitudinal axis and a plurality of feed channels, the vacuum ports of the plurality of mounting substrates fluidly coupled to the plurality of primary channels via the plurality of feed channels; and

wherein the outlet manifold comprises a plurality of primary channels extending along a second longitudinal axis, the first and second longitudinal axes being parallel.

~~24.~~18. The system of claim ~~23~~ 17 wherein the plurality of feed channels extend perpendicular to the first longitudinal axis.

~~25.~~19. The system of claim ~~23~~ 17 wherein each of the plurality of mounting substrates comprises a cradle and a port block.

~~26. The system of claim 25 wherein the cradle comprises first, second, third, and fourth slots, the first and second slots extending through the cradle from a first side to an opposite second side and the third and fourth slots extending through the cradle from a third side to an opposite fourth side, the first and second sides being perpendicular to the third and fourth sides.~~

~~27. The system of claim 26 wherein the outlet manifold extends through the first and second slots and the vacuum manifold extends through one of the third and fourth slots.~~

~~28. The system of claim 25 wherein the port block comprises the vacuum port and the outlet port.~~

~~29. An apparatus for controlling flow of a process fluid, the apparatus comprising:~~
~~an inlet;~~
~~an outlet;~~
~~a bleed port;~~
~~a flow path extending from the inlet to the outlet;~~
~~a first valve operably coupled to the flow path and located between the inlet and the outlet, the first valve configured to control flow of a process fluid in the flow path;~~
~~a flow restrictor having a flow impedance, the flow restrictor operably coupled to the flow path and located between the inlet and the outlet;~~
~~a second valve operably coupled to the flow path and located between the inlet and the outlet, the second valve configured to control flow of the process fluid from the flow path to the bleed port;~~
~~a mounting portion, the mounting portion comprising the outlet and the bleed port.~~

~~30. The apparatus of claim 29 wherein the mounting portion comprises a sealing surface and a plurality of mounting holes.~~

~~31. The apparatus of claim 29 wherein the mounting portion comprises a planar surface.~~

~~32.~~20. A method of manufacturing articles, the method comprising:

a) providing a first apparatus for controlling flow of a first process fluid, the first apparatus for controlling flow comprising a mounting portion;

b) providing a first mounting substrate comprising a surface, the surface comprising an outlet port and a vacuum port, the outlet port fluidly coupled to an outlet manifold and the vacuum port fluidly coupled to a vacuum manifold, the mounting portion of the first apparatus for controlling flow secured to the surface of the first mounting substrate, the outlet manifold fluidly coupled to a processing chamber, and the vacuum manifold fluidly coupled to a vacuum source;

c) supplying the first process fluid to the first apparatus for controlling flow;

d) flowing the first process fluid through the first apparatus for controlling flow;

e) delivering the first process fluid from the first apparatus for controlling flow to the vacuum port of the first mounting substrate;

f) discharging the first process fluid through the vacuum manifold to the vacuum source;

g) delivering the first process fluid from the first apparatus for controlling flow to the outlet port of the first mounting substrate; and

h) performing a process on an article within the processing chamber.

~~33. The method of claim 32 wherein the article is a semiconductor device.~~

~~34. The method of claim 32 wherein the apparatus for controlling flow comprises a bleed port fluidly coupled to the vacuum port of the first mounting substrate and an outlet fluidly coupled to the outlet port of the first mounting substrate.~~

~~35. The method of claim 34 wherein the apparatus for controlling flow comprises a planar surface, the bleed port and the outlet located on the planar surface.~~

~~36. The method of claim 32 further comprising steps a-1) and b-1), step a-1) comprising providing a second apparatus for controlling flow of a second process fluid, the second apparatus for controlling flow comprising a mounting portion, and step b-1) comprising providing a second mounting substrate comprising a surface, the surface comprising an outlet port and a vacuum port, the outlet port fluidly coupled to the outlet manifold and the vacuum port fluidly coupled to the vacuum manifold, the mounting portion of the second apparatus for controlling flow secured to the surface of the second mounting substrate;~~

~~37. The method of claim 36 further comprising steps c-1), d-1), and e-1), wherein step c-1) comprises supplying the second process fluid to the second apparatus for controlling flow, step d-1) comprises flowing the second process fluid through the second apparatus for controlling flow, and step e-1) comprises delivering the second process fluid from the second apparatus for controlling flow to the vacuum port of the second mounting substrate.~~

~~38. The method of claim 32 wherein step e) occurs prior to step g).~~

~~39. The method of claim 32 wherein step e) occurs simultaneously with step g).~~

~~40. The method of claim 32 wherein step e) occurs subsequent to step g).~~